How valid are Motorcycle Safety Data?

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Biography

Dr Narelle Haworth began working at the Monash University Accident Research Centre in 1987 after completing a PhD in Psychology. Currently a Senior Research Fellow at the Centre, Narelle's research has spanned the breadth of road safety issues from driver impairment due to fatigue, alcohol and drugs to heavy vehicle safety and motorcycle safety. Narelle has managed studies of motorcycle crash injuries to children and adolescents, motorcycle crash countermeasures and a major case-control study of motorcycle crashes. She has also studied motorcyclist hazard perception, training programs, and surveyed older motorcyclists.

Abstract

The recent increases in motorcycle crashes across many jurisdictions have led to a resurgence in motorcycle safety research. Much of the research has applied the general data analysis designs and methods of road safety, analysing road authority crash databases with or without comparisons with exposure data to estimate crash or injury rates. Yet motorcycle crash data and motorcycle exposure data have particular limitations that can affect the validity of the results and the conclusions drawn. The limitations in motorcycle crash data can affect estimates of the total size of the problem, severity profiles, and the relative importance of different types of crashes and of different age groups and causative factors. This is most evident in analyses related to unriders (unlicensed riders or unregistered motorcycles). The usefulness of third party insurance data and hospital data is also examined in this paper. In calculating crash or injury risk, the denominators commonly used are licences held, registered vehicles or distance travelled. The paper discusses the advantages and disadvantages of each type of denominator in developing measures of motorcycle safety.

1. INTRODUCTION

After a period of sustained reductions, motorcyclist fatalities and injuries appear to be increasing. While the number of motorcyclist fatalities in Australia halved from 1987 to 1997, the number increased by 27% from 1999 to 2002. In Victoria, the number of motorcyclists killed increased from 38 in 1999 to 64 in 2001 before stabilising at 56 in 2002 (ATSB, 2003). Not surprisingly, interest in motorcycle safety has increased.

Yet measures of the size and characteristics of the motorcycle crash problem are only as reliable as the data on which they are based. Most analyses that have been reported implicitly assume that those crashes which occur are reported to Police (or are no less likely to be reported than crashes of other groups), that Police descriptions of what happened in the crash are accurate and that the measures of the amount of motorcycling activity used in denominators of crash and injury rates are appropriate. Both motorcycle groups and some researchers (Diamantopoulou, Brumen, Dyte and Cameron, 1995; FORS, 1999) have challenged these assumptions. In Great Britain, the Advisory Group on Motorcycling (undated) cited under-reporting of crashes, Police underestimation of crash severity and discrepancies in the total numbers of motorcycles from different data sources as issues affecting the understanding of

motorcycle safety. This paper describes the limitations of crash data and exposure data and the implications for analyses and interpretation of crash and injury rates.

2. LIMITATIONS OF CRASH DATA

The limitations of motorcycle crash data that have been identified include: uncertainty related to the scope of crash data, under-reporting, perceived problems in Police descriptions of crashes, and reliance on fatality data.

2.1 The scope of crash data

Generally, the crash data used by road safety agencies relate to crashes that occur on roads (or road-related areas) and result in injury or damage exceeding a threshold level and are reported to Police. Many motorcycle crashes that should be included are not because they are not reported to Police (this is discussed in the next section). Many other motorcycle crashes are outside the scope of these crash data sets because they occur "off-road". While road safety agencies have little interest in these crashes, they are not a minor issue. Haworth, Ozanne-Smith, Fox and Brumen (1994) found that, for riders aged under 25, on- and off-road crashes resulted in similar total numbers of hospital bed days.

The scope of the crash data may be wider than the scope of available exposure data. For example, crash databases correctly include those crashes involving unlicensed riders that are reported (outside the scope of exposure measured in terms of licence holders), and unregistered motorcycles (outside the scope of exposure measured in terms of registered motorcycles). This has implications for the interpretation of crash rates (see FORS, 1999).

An issue of lesser concern is that crash databases cover crashes occurring within a specific geographic region (usually a State or Territory) while the exposure data may relate to place of residence of the rider, or place of registration of the motorcycle or place of licence of the rider, and any of these may be outside the geographic region covered by the crash data.

2.2 Under-reporting

"Under-reporting" describes the problem that not all crashes that are required by law in a jurisdiction to be reported to Police, are represented in the crash data file. Under-reporting leads to underestimation of the sizes of the crash and injury problems. Evidence suggests that there is considerably greater under-reporting of motorcycle crashes than crashes of other vehicles (e.g. Diamantopoulou et al, 1995).

Most quantitative studies of under-reporting have compared the number of motorcyclists reported as injured in Police-based crash databases with the number of motorcyclists reported as injured in on-road crashes in hospital admission databases. Most studies have shown that many more injured motorcyclists are identified through the hospital databases than through the Police crash databases. For example, in 2000, Police reported that 22 motorcyclists were killed and 230 hospitalised in Western Australia (Legge, Kirov and Cercarelli, 2001). In contrast, hospitals recorded that 406 motorcyclists were admitted following a crash. Differences in coding practices between the Police and hospitals may account for part of the difference, but the discrepancy is larger for motorcyclists than for all road users. The major contributor to the discrepancy is likely to have been motorcyclists not reporting crashes to Police.

For motorcycle crashes as in other crashes, the extent of under-reporting is greater for less severe crashes. This inflates the average severity of motorcycle crashes and potentially over-estimates the risks associated with motorcycling.

Some particular types of crashes are less likely to be reported. Diamantopoulou et al. (1995) found that single motorcycle crashes were markedly under-reported. While objective data do not exist, it is widely believed that crashes involving unlicensed riders, unregistered motorcycles or illegal blood alcohol levels are unlikely to be reported to Police unless they are very severe and/or someone else notifies Police. This has two consequences for the crash databases: an underestimation of the number of crashes in which these factors are involved and an over-estimation of the severity associated with these factors.

2.3 Problems in Police descriptions of crashes

Some motorcyclists question the accuracy of Police descriptions of crashes. They believe that many crashes described in Police accident report forms as single vehicle crashes were actually caused by a motorcyclist failing to successfully avoid a car or truck that then drove off. They are also concerned that some motorcycle crashes are coded as involving excessive speed because of incorrect interpretation of skid marks by Police. They also consider that the crash reporting system fails to take account of road conditions contributing to motorcycle crashes (de Rome, Stanford and Wood, 2002).

2.4 Problems with fatality data

Nationally, a lot of reliance is placed on fatality data, because of the problems in comparing injury data from different States and Territories. Even at a State or Territory level, fatalities have a stronger political and media profile than serious injuries, despite the total cost of serious injuries to the community being greater than that of fatalities. Fatality data are also more timely than data for other levels of injury. However, the number of motorcyclist fatalities is small, particularly if disaggregated by age group within a State or over a relatively short time period. This means it is hard to identify real trends in a timely manner, particularly when the data are disaggregated.

In addition, the characteristics of fatal crashes may differ from those of non-fatal crashes. For example, evidence suggests that illegal levels of alcohol are present in similar percentages of killed drivers and riders but in much lower percentages of injured riders than injured drivers (Haworth, 2001). Based on the fatality data, it would be mistakenly concluded that alcohol was as big a problem in motorcycle crashes as it is in car crashes.

Unfortunately, the problem of under-reporting means that it is often difficult to assess the extent to which reliance on fatality data is providing a biased view of motorcycle safety issues. If the “true” nature of non-fatal motorcycle crashes is not known, then it is difficult to assess how different fatal crashes are from other crashes.

3. HOSPITAL DATA

The potentially more complete coverage of motorcycle crashes in hospital data than in Police-reported crash data was described in the earlier discussion of under-reporting. Hospital data sets also provide good injury data that can be used to measure the cost of the crash (e.g. in terms of bed days of stay) and can be used to investigate effects of vehicle and roadway and roadside design on injury outcomes. However, hospital data do not provide a clear indication of

the number of crashes resulting in hospital admission, the number of people in each crash, crash location, licence status of the rider or registration status or any details of the motorcycle.

4. THIRD PARTY INSURANCE CLAIMS DATA

Third party insurance data, like hospital data, can potentially provide more useful information regarding injuries and the cost of crashes than Police-reported crash databases. It can also identify sub-groups where the cost of the claims is greater for a given severity of injury, compared to other sub-groups. For instance, the costs of claims for motorcycle riders in their 30s and 40s may be greater than for younger riders because the older riders have higher incomes or more dependants.

However, the scope of coverage of crashes depends on whether the scheme is a fault-based scheme or a no fault scheme. In NSW, which has a fault based scheme, Christie and Harrison (2001) noted that there were about half as many claims in the Motor Accident Authority database as the number of motorcycle crashes in the RTA accident database. In addition, the ability to identify trends may be affected by changes in rules relating to eligibility to claim.

5. LIMITATIONS OF EXPOSURE DATA

In calculating crash or injury risk, the number of crashes or injuries is divided by a measure of exposure – a measure of motorcycling activity. The exposure measures commonly used are licences held, registered vehicles or distance travelled. This section discusses the advantages and disadvantages of each of these types of denominator in developing measures of motorcycle safety.

5.1 Registered motorcycles

Measures of the total number of motorcycles registered and the number of new registrations are available from each State and Territory. Registration data has a number of drawbacks for use as a measure of motorcycling activity or exposure to crash risk. Motorcycles that become involved in crashes may not be registered, and not all registered motorcycles are ridden on the road or ridden at all. In Victoria, some motorcycles are registered to provide TAC cover, even if there is no intention to ride on the road. In NSW, the need for compulsory inspection of the motorcycle before the registration can be renewed may tend to reduce the number of registered (but unused) motorcycles. Christie and Harrison (2001) estimated that the ratio of licence holders to registered motorcycles in Victoria is greater than two to one and it is almost five to one in NSW.

If the distance travelled per registered motorcycle differs between jurisdictions, then this will affect comparisons of crash risk per registered motorcycle. These differences in crash risk may be mistakenly attributed to other factors such as differences among the jurisdictions in training and licensing practices.

Crash rates per registered vehicle should not be used to compare different types of vehicles because distance travelled differs markedly, with annual distance travelled by motorcycles being much less than for passenger cars (4,100 kms versus 14,600 kms, ABS, 2003).

5.2 Licence holders

For car drivers (other than older drivers), it is generally assumed that everyone who has a licence, drives, and therefore it is useful to calculate and compare crash and injury rates per licence holder. For motorcycle licence holders, this assumption is not justified. In Victoria, NSW and Queensland (at least), motorcycle licences remain current at no additional cost to people who hold car licences. This means that many motorcycle licence holders are not active motorcyclists (47% of motorcycle licence holders aged over 30 in Victoria according to Haworth, Mulvihill & Symmons, 2002) and that retired riders can return to riding without this being reflected in the licensing figures.

5.3 Distance travelled

Crash and injury rates per kilometre travelled are considered the most valid indices of risk. Yet, there is little information available about the amount of motorcycle riding that is done and how that has changed from year to year. More detailed information about motorcycle exposure, such as the time of day that trips occur, the reasons for travel and rider demographics, is even more sparse.

The Australian Bureau of Statistics publishes estimates of total and average distance travelled by registered motorcycles and other vehicles in the (generally) annual Survey of Motor Vehicle Use (SMVU). The Australian Transport Safety Bureau uses these data to calculate fatality rates for motorcycles and other vehicles. The distances travelled are estimated from a survey of registered vehicles that requests odometer readings at the beginning and end of a 3-month period. There are a number of difficulties in using this data to estimate crash and injury rates:

- The distances relate to travel by the vehicle, not a rider. If the motorcycle was ridden by more than one rider, this would overestimate the distance ridden by a rider. If a rider rode more than one motorcycle, it would underestimate the distance ridden by a rider.
- The distance travelled off-road by registered motorcycles is included (but not in the Police reported crash data)
- The on-road distances travelled by unregistered motorcycles are not included (but are included in the Police reported crash data)
- The estimates are not consistent over time because of changes in the survey methodology (ABS, 2003). This makes estimation of long-term trends difficult.
- The number of registered motorcycles sampled is relatively small and so the potential sampling and non-sampling errors are high

Other estimates of the distance travelled by motorcyclists have been reported by Arup Transportation Planning (1995), Haworth, Smith, Brumen and Pronk (1997) and Haworth et al. (2002). The estimates of total distance travelled by motorcyclists and the estimated percentage of travel that involves motorcycles in Victoria from the 1994 VicRoads Exposure Survey (Arup Transportation Planning, 1995) were lower than that obtained from the SMVU (about 115 million kms per year versus 352 milion kms per year and about 0.4% versus 0.76%). This is not surprising, given that the survey was undertaken during July and August when motorcycle use is lower (Haworth et al., 1997; Haworth et al., 2002). Haworth et al. found that motorcycles comprised 0.5% of vehicles, and that this proportion did not differ greatly by road type, although it was generally higher during daytime (6am-6pm) and lower during night-time (6pm-6am).

6. CONCLUSIONS

The real number of motorcycle crashes is greater than estimated from Police-reported crash data. This should be considered when allocating resources to motorcycle safety programs because the actual benefit:cost ratios will be higher than those calculated using Police-reported crash data. Crash and hospital data should be compared to develop multipliers that can be applied to give an improved estimate.

The real number of non-fatal crashes involving unlicensed riders, unregistered motorcycles or illegal blood alcohol levels is greater than estimated from Police-reported crash data. Thus, any conclusions that these crashes are more likely to be fatal than crashes not involving these factors are potentially spurious.

Basing road safety policy and programs on motorcyclist fatality data may address the relatively small number of fatalities but may be misdirected in terms of the factors involved in the much larger number of injury crashes.

In calculating crash or injury risk, the most valid measure of motorcycling activity is distance travelled. However, each source of this data has drawbacks that need to be considered. Crash or injury rates per licence holder are likely to markedly underestimate the true situation and the number of licence holders is a very sluggish indicator of changes in motorcycling. Estimating crash or injury risk in terms of registered motorcycles is more appropriate, but has its own limitations. The standard calculations of crash rates may be insufficient or inappropriate to answer questions about specific groups of motorcyclists. Linking motorcycle registration and licensing data and surveys appear to be promising sources of such information.

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